

MOTION AND FORCES



**GRADE LEVEL: ELEMENTARY SCHOOL
 KINDERGARTEN AND 1ST GRADE**

Student Objectives

- Understand the different phases of the engineering process (ask, imagine, plan, create, test and improve)
- Understand how objects move and change positions, including race cars
- Define the word force as it relates to movement

Materials List

- Video:
 - o Pit Stop: (starts at 1:26:00) - <https://www.youtube.com/watch?v=vQoKpCm1mbw>
 - o Start of Race: (starts at 19:10) - <https://www.youtube.com/watch?v=c9y496YjiUJ>
 - Restart of Race: (starts at 1:47:00)
- Photo: Garage (push and pull)
- Copy/printer paper
- Two or more magnets
- Magnetic surface like a baking sheet or refrigerator door
- Variety of non-aluminum metal objects (scissors, nuts, washers, etc.)
- Thin cardboard or cardstock
- Tracing paper
- Outline of car (PDF)
- Racetrack outline (hand drawn or PDF)
- Crayons, markers and/or colored pencils





Lesson Plan and Procedures for Adults

Notes: Kindergarten students are introduced to objects, how they move with a force and move by changing positions.

1st grade students learn the force that moves an object acts in one of two ways (push or pull) to create movement.

1. Introduce the student(s) to what an object is. Define what an object is.
2. Play a quick game to help the student(s) understand the properties of an object.
 - Gather a few objects (up to 10) that are different sizes, weights, colors, shapes and textures such as a crayon, piece of fruit, toy, towel and a book. Do not let your child see the objects until you have covered them with a sheet.
 - Place the objects under a cloth/sheet on a table or flat surface. Explain you want them to remember what objects they see when the sheet is lifted.
 - Lift the sheet and let the child observe the objects.
 - Cover the objects after 10 to 20 seconds with the sheet.
 - Ask the student to describe or name the objects they saw. As they name the objects, pull it out from under the sheet. Continue until you have at least 3-4 different objects.
 - End the game by talking about the properties of the object. What objects are round? Heavy? Smooth?
3. Review what the definition of an object is and what properties it may have.
 - Definition: something material that may be perceived by the senses; objects have shape, size, mass, color, texture.
4. Ask the student(s) to demonstrate motion. You can play a quick game of 'Simon Says' or a version of musical chairs without the chairs – where the child moves in different ways until the music is stopped.
 - Motion or movement is the change of position.

5. Play a quick motion game: "Crew Chief, May I?" As with "Mother, May I?" the child must ask permission to move.





- You can do this either inside or outside.
 - If outside, use the sidewalk or driveway to have a pathway for the child to move on like a hopscotch board. Create your own hand gestures to indicate moving forward, backwards, left or right.
 - If you are inside, you can also create a board using tiles on your floor or household items like pillows or paper. For movement, you can do verbal instructions or use playing cards: The child asks if they can move, and you draw a card to see how many spaces they can move. (A 2 card can represent two steps forward; a Jack can mean two steps backwards.) Keep it simple with four to five cards.
6. Try playing the game for about 5 minutes. When you are done, ask the student(s) if they are in the same position they were in when they started the game. How did they move (direction)? Explain to them that this is called “changing positions.”
 7. NASCAR connection: Select a video clip from a NASCAR race (listed above.) Have the student(s) focus on one specific car while they watch. After viewing the video, ask the student(s) to describe what they saw the race car doing (changing position, moving from one place to another.)
 8. Tell the student(s) objects move using a force. In the game we played and in the racing video clip, movement happened using a push or a pull.
 9. Examine a couple of racing still shots and have the child identify what type of force (push or pull) may be occurring in the photo. Examples include the tire changer is pushing the tire on to the car or a race car driver will push on the pedal (gas) to make the car move. Point out each of the jobs the people in the photos have (gas person, tire changer, pit crew, etc.)
 10. Experiment with Force: Explain the student(s) is going to experiment with force (push and pull) by using magnets.
 - NOTE: You will need a metal surface and one or two magnets.
 - Using the two magnets, have the student(s) explore holding the magnets near each other as well as other magnetic surfaces and objects. See if they can either feel the magnet pull or push away from the other surface.
 - Explain to the student(s) when magnets pull together, they ‘attract,’ and when they push apart, they ‘repel.’
 11. Create a race car and have it move around a track using two magnets.
 - Make the track using either a hand drawn track or a printed track from the materials. Tracks should be at least 5 by 7 inches. (If desired, allow the child a few minutes to color their racetrack.)





- Print and cut out a race car on card stock (if cardstock paper is not available, print on standard copy paper and glue to cereal box cardboard.) Have the child design and color a paint scheme (as they saw in the video clip) and a number on their car. All race cars have different numbers and paint schemes to differentiate them from one another.
 - Tape or glue the race car onto a magnet (remove a magnet from a refrigerator magnet.)
 - Place the race car on the racetrack. Using a second magnet, place it beneath the race car (under the paper) so that the two magnets are in close contact. See if the car will move.
 - Encourage the child to move the car with just the magnets around the track. Then have the car move in reverse by flipping the magnet underneath over.
 - Remember: just like your car, race cars also have reverse as well.
12. To conclude and wrap up the activity, have the student(s) discuss and share what they learned. Ask questions as needed to review key concepts: What is an object? How does an object move (push or pull)? Can objects change position (or how can they)

